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UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Attorney Docket No.	042390.P9919
First Inventor	Kingsum Chow
Title	APPARATUS AND METHOD FOR FACILITATING ACCESS TO NETWORK RESOURCES
Express Mail Label No.	EL034436510US

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents

ADDRESS TO: Assistant Commissioner for Patents
Box Patent Application
Washington, DC 20231

1. ☒ Fee Transmittal Form (e.g., PTO/SB/17)
(Submit an original and a duplicate for fee processing)

2. ☐ Applicant claims small entity status.
See 37 CFR 1.27.

3. ☒ Specification [Total Pages 26]
(preferred arrangement set forth below)
- Descriptive title of the Invention
- Cross References to Related Applications
- Statement Regarding Fed sponsored R & D
- Reference to sequence listing, a table, or a computer program listing appendix
- Background of the Invention
- Brief Summary of the Invention
- Brief Description of the Drawings (if filed)
- Detailed Description
- Claim(s)
- Abstract of the Disclosure

4. ☒ Drawing(s) (35 U.S.C. 113) [Total Sheets 8]

5. Oath or Declaration [Total Pages 6]
a. ☐ Newly executed (original or copy)
b. ☐ Copy from a prior application (37 C.F.R. § 1.63(d))
(for continuation/divisional with Box 18 completed)
i. ☐ DELETION OF INVENTOR(S)
Signed statement attached deleting inventor(s) named in the prior application, see 37 CFR 1.63(d)(2) and 1.33(b).

6. ☐ Application Data Sheet. See 37 CFR 1.76

7. ☐ CD-ROM or CD-R in duplicate, large table or Computer Program (Appendix)

8. Nucleotide and/or Amino Acid Sequence Submission
(if applicable, all necessary)
a. ☐ Computer Readable Form (CRF)
b. Specification Sequence Listing on:
i. ☐ CD-ROM or CD-R (2 copies); or
ii. ☐ paper
c. ☐ Statements verifying identity of above copies

ACCOMPANYING APPLICATION PARTS

9. ☐ Assignment Papers (cover sheet & document(s))
10. ☐ 37 C.F.R. § 3.73(b) Statement (when there is an assignee) ☐ Power of Attorney
11. ☐ English Translation Document (if applicable)
12. ☐ Information Disclosure Statement (IDS)/PTO-1449 ☐ Copies of IDS Citations
13. ☐ Preliminary Amendment
14. ☒ Return Receipt Postcard (MPEP 503)
(Should be specifically itemized)
15. ☐ Certified Copy of Priority Document(s)
(if foreign priority is claimed)
16. ☐ Request and Certification under 35 U.S.C. 122 (b)(2)(B)(i). Applicant must attach form PTO/SB/35 or its equivalent.
17. ☐ Other: .....

18. If a CONTINUING APPLICATION, check appropriate box, and supply the requisite information below and in a preliminary amendment:
☐ Continuation ☐ Divisional ☐ Continuation-in-part (CIP) of prior application No: _____
Prior application Information: Examiner _____ Group/Art Unit: _____

For CONTINUATION OR DIVISIONAL APPS only: The entire disclosure of the prior application, from which an oath or declaration is supplied under Box 5b, is considered a part of the disclosure of the accompanying continuation or divisional application and is hereby incorporated by reference. The incorporation can only be relied upon when a portion has been inadvertently omitted from the submitted application parts.

18. CORRESPONDENCE ADDRESS

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FEE TRANSMITTAL for FY 2000

Patent fees are subject to annual revision.

TOTAL AMOUNT OF PAYMENT ($) 988.00

Complete if Known	
Application Number	
Filing Date	November 28, 2000
First Named Inventor	Kingsum Chow
Examiner Name	
Group/Art Unit	
Attorney Docket No.	042390.P9919

METHOD OF PAYMENT (check one)

1. ☒ The Commissioner is hereby authorized to ~~charge indicated fees and~~ credit any overpayments to:

Deposit Account Number: 02-2666

Deposit Account Name: Blakely, Sokoloff, Taylor & Zafman LLP

☒ Charge Any Additional Fee(s) Required Under 37 CFR §§ 1 16, 1.17, 1.18 and 1.20

☐ Applicant claims small entity status. See 37 CFR 1.27

2. ☒ **Payment Enclosed:**

☒ Check ☐ Credit card ☐ Money Order ☐ Other

FEE CALCULATION

1. BASIC FILING FEE

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
101	710	201	355	Utility filing fee	710.00
106	320	206	160	Design filing fee	
107	490	207	245	Plant filing fee	
108	710	208	355	Reissue filing fee	
114	150	214	75	Provisional filing fee	

SUBTOTAL (1) ($) 710.00

2. EXTRA CLAIM FEES

			Extra Claims		Fee from below		
Total Claims	31	- 20** =	11	X	18.00	=	$198.00
Independent Claims	4	- 3** =	1	X	80.00	=	$80.00
Multiple Dependent						=	

**or number previously paid, if greater, For Reissues, see below

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description
103	18	203	9	Claims in excess of 20
102	80	202	40	Independent claims in excess of 3
104	260	204	135	Multiple Dependent claim, if not paid
109	80	209	40	**Reissue independent claims over original patent
110	18	210	9	**Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) ($) 278.00

FEE CALCULATION (continued)

3. ADDITIONAL FEE

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
105	130	205	65	Surcharge - late filing fee or oath	
127	50	227	25	Surcharge - late provisional filing fee or cover sheet.	
139	130	139	130	Non-English specification	
147	2,520	147	2,520	For filing a request for reexamination	
112	920*	112	920*	*Requesting publication of SIR prior to Examiner action	
113	1,840*	113	1,840*	*Requesting publication of SIR after Examiner action	
115	110	215	55	Extension for response within first month	
116	390	216	195	Extension for response within second month	
117	890	217	445	Extension for response within third month	
118	1,390	218	695	Extension for response within fourth month	
128	1,890	228	945	Extension for response within fifth month	
119	310	219	155	Notice of Appeal	
120	310	220	155	Filing a brief in support of an appeal	
121	270	221	135	Request for oral hearing	
138	1,510	138	1,510	Petition to institute a public use proceeding	
140	110	240	55	Petition to revive - unavoidable	
141	1,240	241	620	Petition to revive - unintentional	
142	1,240	242	620	Utility issue fee (or reissue)	
143	440	243	220	Design issue fee	
144	600	244	300	Plant issue fee	
122	130	122	130	Petitions to the Commissioner	
123	130	123	130	Petitions related to provisional applications	
126	180	126	180	Submission of Information Disclosure Stmt	
581	40	581	40	Recording each patent assignment per property (times number of properties)	
146	710	246	355	Filing a submission after final rejection (37 CFR § 1.129(a))	
149	710	249	355	For each additional invention to be examined (37 CFR § 1.129(b))	
179	710	126	355	Request for Continued Examination (RCE)	
169	900	169	900	Request for expedited examination of a design application	

Other fee (specify) _____

Other fee (specify) _____

* Reduced by Basic Filing Fee Paid

SUBTOTAL (3) ($)

SUBMITTED BY

Complete (if applicable)

Name (Print/Type)	Gregory B. Caldwell	Registration No. (Attorney/Agent)	39,926	Telephone	(503) 684-6200
Signature				Date	11/28/00

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42390.P9919 *Patent*

UNITED STATES PATENT APPLICATION

FOR

Apparatus and Method For Facilitating Access To Network Resources

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Express Mail mailing label number: EL034436510US

Apparatus and Method For
Facilitating Access To Network Resources

Field of the Invention

The invention generally relates to providing network resources to clients, and more particularly to providing mirrored network resources with multiple network hosts, where a requesting client is automatically directed to a network host having a more efficient communication channel with the client.

Background

With the widespread availability of intranets and the Internet in the home and workplace, network traffic has become increasingly congested, leading to increasing client delays in obtaining desired network resources.

In an effort to avoid such delays, a common technique is to host a network site, e.g., a web site or other network resource, on multiple network hosts in different geographic areas. Thus, a network site may be hosted in different countries and localities within the countries. An incoming client networking connection is then manually or automatically redirected to a host geographically closest to the client.

In a manual environment, on contacting one host, the host returns to the client a network resource, such as a web page, providing alternative hosts for the client. For example, assuming a client receives a web page, the page may contain hyperlinks to the available network hosts for the contacted site.

In an automatic redirection environment, when the network site's network name, e.g., a Uniform Resource Locator (URL), is resolved by a Domain Name Server (DNS), rather than having the DNS return an established (or static) mapping of a network address for the network site's name, instead the DNS returns the network address of whichever network host is geographically closest to the client. It is assumed that host addressing conforms to naming devices on a network, with DNS supplying an address, such as a Transmission Control Protocol/Internet Protocol (TCP/IP) address, for the named device. The theory is that geographically distant network hosts will have longer network delays, while close network hosts will have short delays. Unfortunately, such an arrangement does not always result in the client being connected to the network host having the most efficient connection to the client, e.g., the network host providing the fastest data response times to the client.

Brief Description Of The Drawings

The features and advantages of the present invention will become apparent from the following detailed description of the present invention in which:

FIG. 1 illustrates a generalized network environment in accordance with one embodiment of the invention.

FIG. 2 is a flowchart illustrating one embodiment for a client to obtain a network site's resources by determining and directing the client connection to an efficient source for the desired network resources.

FIG. 3 illustrates one embodiment for redirecting the client to the more efficient communication source.

FIG. 4 illustrates another embodiment for redirecting the client to multiple more efficient communication sources.

FIG. 5 is a flowchart illustrating one embodiment for determining an efficient communication source to which to direct the client.

FIG. 6 illustrates an exemplary table for tracking clients and their communication efficiencies for different network hosts.

FIG. 7 illustrates a generalized approach to determining efficiency ratings.

FIG. 8 illustrates a suitable computing environment in which certain aspects of the invention may be implemented.

Detailed Description

FIG. 1 illustrates a generalized network environment in accordance with one embodiment of the invention.

As illustrated, a United States based Client 1 **100** and a Europe based Client 2 **102** are in communication with a network **104**, such as an intranet, the Internet, or other networking environment (e.g., wireless, satellite, etc.). Although a single network is illustrated, it will be appreciated that there may be many individual networks, wired and wireless, that are interconnected to form the illustrated network. Clients **100**, **102** seek network resources, such as web pages or other data, from a network site **106**. To facilitate access to the network site's data, some or all of the site's network resources are "mirrored" or otherwise made available through other network hosts **108**, **110**, **112**.

As illustrated, the other mirroring network hosts may include, for example, a United States based Network Host **108**, a Europe based Network Host **110**, and an Asia

based Network Host **112**. As indicated by the ellipses, there may be many more hosts in other localities, each mirroring some or all of Original Network Site resources. As used herein and the claims that follow, unless indicated otherwise either explicitly or implicitly through context, the phrase "network host" may collectively reference the Original Network Site **106** as well as the mirroring network hosts **108**, **110**, **112**.

When Client 1 **100** seeks to access the network site **106**, it is assumed that Client 1 provides the name of the Original Network Site to a name resolution service, such as Domain Name Server (DNS) 1 **114**. In response, DNS 1 returns a network address for the Original Network Site **106**, or that of the mirroring network hosts **108**, **110**, **112**, depending on the resolution strategy in use.

Assuming a prior art geographic-base resolution strategy, if the United States based Network Host **108** is geographically closest to Client 1 **100**, then when Client 1 **100** attempts to resolve the Original Network Site's **106** network name, DNS 1 **114** will direct Client 1 to the United States Network Host. Client 1 then communicates directly with the United States Network Host to obtain network resources. Similarly, if Client 2 **102** tries contacting the Original Network Site, since Client 2 is in France, with geographic-based resolution, DNS 2 **116** returns the network address for the Europe based Network Host **110**.

One problem with the geographic based approach, however, is that it assumes geographic proximity equates with communication efficiency. Unfortunately this may not be the case. For example, local and regional network congestion, problems in network hardware, incorrectly configured equipment, etc., can result in a nearest of the network hosts being a less efficient data source than one of the other network hosts.

Or, a particular remote network host might be reachable over a higher-speed data pathway, such as an Internet "backbone" (e.g., a fast Synchronous Optical Network (SONET) Optical Carrier (OC)). Thus, the result provided by a geographical-based resolution DNS may be sub-optimal.

FIG. 2 is a flowchart illustrating one embodiment for Client 1 **100** (FIG. 1) to select between available network hosts **106-112** for obtaining the Original Network Site's **106** network resources according to the present invention. In one embodiment, in order to ensure that Client 1 is connected to a network host providing a more efficient communication session, response times for receiving network data from the various network hosts are measured, and the host having fastest response time is utilized.

A first operation is for Client 1 **100** to submit **200** the Original Network Site's name to its resolution service, e.g., DNS 1 **114**. DNS 1 then returns **202** a network address corresponding to the Original Network Site. In one embodiment, DNS 1 returns an address for a geographically closest network host as in the prior art. In an alternate embodiment, DNS 1 simply returns the network address for the Original Network Site. Once Client 1 has a resolved network address, it then connects **204** to the provided network address. In response, Client 1 then receives **206** initial network resources from the network host.

In one embodiment, before returning the network resource to Client 1 **100**, the contacted network host determines the most efficient communication pathway to Client 1, e.g., it determines the network host with which Client 1 ought to be communicating. Towards this end, the Original Network Site **106** and mirroring network hosts **108**, **110**,

112 are inspected (FIG. 5) to determine an efficiency rating tracked by each host regarding communication with Client 1. The network host (or hosts) identified as being most efficient is then encoded within the network resource returned to Client 1.

Based on this encoding, Client 1 then continues its retrieval **208** of network resources according to the embedded reference. It will be appreciated that the resource can be of any data type, including web page code, audio data, video data, a database, operational commands / directives for controlling Client 1, another data type allowing for embedded links / references to other resource locations, or some combination of these data types. Thus, for example, a network resource retrieved from a first host may be a Joint Photographic Experts Group (JPEG) graphics file containing embedded tags linking to a more efficient second host for processing the image.

FIG. 3 illustrates one embodiment in which the returned network resource is a web page **300**, and the encoded reference is an embedded link **302** to a resource located on the network host **106-112** that was identified as being most efficient.

In this embodiment, Client 1 **100** contacts the network site indicated by DNS 1 **114** and receives a web page in which its web page links, rather than referencing the originator of the web page, instead directs Client 1 towards the network host identified as being most efficient.

In another embodiment (not illustrated), the returned network resource is a redirection request to redirect Client 1 **100** to communicate directly with the efficient communication source. Common examples of redirection commands include HyperText Markup Language (HTML) redirection commands, Java/JavaScript code to

redirect a browser, and Common Gateway Interface (CGI) / Perl scripts to redirect Client 1. In this embodiment, rather than Client 1 receiving a substantive network resource from the contacted network host, such as an entire web page, instead Client 1 **100** receives minimal data required to effect a redirection of its communication.

FIG. 4 illustrates another embodiment, in which the returned network resource **400** from the network host identified by a DNS includes multiple encoded references to multiple network hosts, with each encoded reference providing a link to the most efficient communication source for the type of resource being linked.

For example, if the returned resource is a web-page, and the web page is to include links **402** to streaming audio and/or visual data, links **404** to electronic commerce (e-commerce), links **406** to database resources, links **408** to telephony operations, etc., then these embedded web page links **402-408** can direct Client 1 to the network hosts **106-112** having highest efficiency for that resource.

In the case of streaming media or other such data types, the link may automatically initialize / start delivery of the streaming media. Thus, with respect to Client 1 **100**, U.S. Network Host **108** (FIG. 1) may be, for example, the most efficient source for audio data (links **402**), while the Original Network Site **106** may be the most efficient source for engaging in e-commerce transactions (links **404**).

FIG. 5 is a flowchart illustrating one embodiment for determining which of the Original Network Site **106** and mirroring Network Hosts **108**, **110**, **112** is the most efficient source for retrieving desired network resources. In one embodiment, each

possible network host (e.g., hosts **106-112**) for handling a client's (e.g., Client 1 **100**) request for network resources maintains a table (see FIG. 6), database, or other data structure tracking known efficiency ratings for communication with the client.

Assume Client 1 **100** attempts to locate **500** the Original Network Site **106** to retrieve certain network resources, such as a web page. As discussed above, assuming geographic resolution, Client 1's DNS returns **502** the network address of the United States Network Host **108** due to it being geographically closest to Client 1.

Client 1 then establishes **504** a network connection with the United States Network Host **108**. In response to this contact, the United States Network Host looks up **506** Client 1 in its tracked efficiency ratings, and determines **508** whether another network host **106**, **110**, **112** is a more efficient source for Client 1's resource request. Assuming the Europe Network Host **110** is most efficient, then the U.S. Network Host constructs **510** a return network resource, in this case a web page, containing encoded references to the Europe Network Host.

FIG. 6 illustrates an exemplary table **600** for tracking clients and their communication efficiencies for different network hosts. It is assumed that a copy of this table is available to all network hosts, or that the table is shared among all hosts.

In the illustrated embodiment, tracked communication efficiency data is indexed according to a client's network address, e.g., it's Internet Protocol (IP) address if a TCP/IP network is used. As illustrated, addresses are stored in the first column **602** of the table. The remaining columns **604-610** store tracked efficiency values indicating efficiency of communication between a particular client and the network hosts.

Thus, for the client having network address 1.2.3.4 (assuming TCP/IP dot quad addressing) in the first row **612** of the table, the stored data indicates the client has measured efficiency values of 12, 22, 9, and 3 respectively for the Original Network Site, and its mirroring sites. (Note that these values have been arbitrarily selected and are not intended to reflect a particular evaluation method or scale.) Consequently, if the client at address 1.2.3.4 initially contacted the Original Network Site, as discussed above, the Original Network Site would look up the client's row **612** in the table, determine the U.S. Network Host mirror is a more efficient source for the client, and direct subsequent communication from the client to be sent to the more efficient source.

In another embodiment, rather than indexing just by the client's network address, the tracking data is also indexed according to the client's TCP/IP response port (e.g., per ports assigned by Port Address Translation (PAT)) designated for sending data to the client. This embodiment allows multiple clients to use Network Address Translation (NAT) (see Network Working Group's Request For Comments (RFC) 1631), PAT, or related techniques for managing and sharing IP addresses.

In one embodiment, each table entry of columns **602-610** include sub-categories (not shown) of data to allow further efficiency specificity with respect to a particular client. For example, each table entry can be sub-divided by time of day to allow host contact optimizations based on actual network usage. Thus, if a client is coming from a location having high network congestion during the hours of 5 PM through 8 PM, a table entry can appropriately direct the client to a more efficient host for that timeframe. It will be appreciated that any characteristic of interest may be used for sub-categories.

In one embodiment, each table entry in columns **602-610** include sub-entries storing reliability ratings (not shown) that can be used to weight or rank stored efficiency ratings. Thus, a client ay be directed to a host having a lesser efficiency, but higher reliability, than another host. It will be appreciated that the illustrated table **600** comprises an efficient and compact data structure, since it provides a 1:1 mapping between table columns and the number of network hosts **106-112** (FIG. 1) (e.g., data centers), and the number of rows may be limited (if desired) according to thresholds or caching techniques.

FIG. 7 illustrates a generalized approach to determining efficiency ratings. Generally, the efficiency ratings stored in the FIG. 6 table can be an average, moving average, or other statistic or heuristic measurement of actual communication performance with the client, and therefore account for real-time disturbances in communication data paths between the client and network hosts.

In one embodiment, the communication efficiency ratings stored in the tracking data correspond to measured communication delays between the client and a network host **106-112** maintaining the tracking data. In one embodiment, efficiency ratings factor in past and/or predicted reliability of a host.

As illustrated, a client contacts **700** a first network host. In response the client receives **702** a network resource from the first network host, where the received network resource contains embedded references which cause the client to request **704** additional resources from the first network host so as to allow the first network host to determine **706** communication efficiency with the contacting client. In one embodiment,

the network resource also directs the client to request additional resources from other network hosts so that they can also determine communication efficiency.

For example, assuming the resource initially received from the first network host is a web page, the web page has embedded links to additional resources, such as to graphics images. Knowing the sizes of the additional resources, the first network host can measure the time delay between the requests for the additional resources to predict the communication efficiency between the client and the first network host. The predicted value is then stored **708** in a FIG. 6 table. As noted above, the web page may be configured to cause the client to perform similar resource requests from other network hosts so they can also determine communication efficiency values.

In one embodiment, the tracked efficiency rating incorporate status information provided by network and server monitoring systems / services, so that systems determined to have problems will be updated as having very inefficient values (or a special value, such as a negative number, indicating complete unavailability). Thus, if a particular server is down, this failure impacts its communication efficiency with the client, which in turn causes a different network host to be determined as being the most efficient source for the client's desired resources.

In addition, determining an efficient host based on real time interactions between a client and each network host providing desired network resources allows one to also perform load balancing of client contact requests. A host having a high load will automatically produce a less efficient response time, causing the client's communication efforts to be directed elsewhere.

Tracked efficiency ratings may be revised on a periodic basis. In one embodiment, the tracked efficiency ratings are revised as a function of the number of data transactions occurring with Client 1. For example, assuming Client 1's desired network resource is web page data, then a small percentage of the web transactions, e.g., 0.01%, can be configured to cause new efficiency ratings to be measured. Measured and revised efficiency ratings are propagated to all network hosts **106-112**.

FIG. 8 and the following discussion are intended to provide a brief, general description of a suitable computing environment in which certain aspects of the illustrated invention may be implemented.

An exemplary system for implementing the invention includes a computing device **800** having system bus **802** for coupling various computing device components. Typically, attached to the bus are non-programmable and programmable processors **804**, a memory **806** (e.g., RAM, ROM), storage devices **808**, a video interface **810**, and input/output interface ports **812**. Storage devices include hard-drives, floppy-disks, optical storage, magnetic cassettes, tapes, flash memory cards, memory sticks, digital video disks, and the like.

The invention may be described by reference to different high-level program modules and/or low-level hardware contexts. Those skilled in the art will realize that program modules can be interchanged with low-level hardware instructions. Program modules include procedures, functions, programs, components, data structures, and the like, for performing particular tasks or implementing particular abstract data types. Modules may be incorporated into single and multi-processor computing devices,

Personal Digital Assistants (PDAs), cellular telephones, and the like. Thus, the storage systems and associated media can store data and executable instructions for the computing device.

The computing device is expected to operate in a networked environment using logical connections to one or more remote computing devices **814**, **816** through a network interface **818**, modem **820**, or other communication pathway. Computing devices may be interconnected by way of a network **822** such as an intranet, the Internet, or other network. Modules may be implemented within a single computing device, or processed in a distributed network environment, and stored in both local and remote memory. Thus, for example, with respect to the illustrated embodiments, assuming computing device **800** is Client 1 **100** (FIG. 1) seeking to obtain a network resource from an Original Network Site **106**, then remote devices **814**, **816** may respectively be the Original Network Site and the United States Network Host **108** mirroring some or all of the Original Network Site's network resources.

It will be appreciated that remote computing devices **814**, **816** may be configured like computing device **800**, and therefore include many or all of the elements discussed for computing device. It should also be appreciated that computing devices **800**, **814**, **816** may be embodied within a single device, or separate communicatively-coupled components, and may include or be embodied within routers, bridges, peer devices, web servers, and application programs utilizing network application protocols such as the HyperText Transfer Protocol (HTTP), File Transfer Protocol (FTP), and the like.

Having described and illustrated the principles of the invention with reference to illustrated embodiments, it will be recognized that the illustrated embodiments can be modified in arrangement and detail without departing from such principles.

And, even though the foregoing discussion has focused on particular embodiments, it is understood that other configurations are contemplated. In particular, even though expressions such as “in one embodiment,” “in another embodiment,” or the like are used herein, these phrases are meant to generally reference embodiment possibilities, and are not intended to limit the invention to particular embodiment configurations. As used herein, these terms may reference the same or different embodiments, and unless implicitly or expressly indicated otherwise, embodiments are combinable into other embodiments. Consequently, in view of the wide variety of permutations to the above-described embodiments, the detailed description is intended to be illustrative only, and should not be taken as limiting the scope of the invention.

What is claimed as the invention, therefore, is all such modifications as may come within the scope and spirit of the following claims and equivalents thereto.

What is claimed is:

1. A method for locating an efficient server among servers mirroring a network site, comprising:

receiving by a first server an incoming connection from a client in communication with said servers over a network;

providing a first efficiency rating for communication between the first server and the client;

determining a second efficiency rating for communication between the second server and the client; and

directing the client to subsequently communicate with the second server when the second efficiency rating is better than the first efficiency rating.

2. The method of claim 1, wherein said providing the first efficiency rating comprises a selected one of: measuring communication efficiency between the first server and the client, and looking-up a previously measured communication efficiency between the first server and the client.

3. The method of claim 1, further comprising:

wherein said directing by the first server comprises returning a network resource to the client containing at least one reference therein to the second server.

4. The method of claim 3, wherein the at least one reference comprises a web page element linking to the second server such that activation thereof by the client causes the client to contact the second server.

5. The method of claim 3,

wherein the network resource received from the first server comprises a tag based data structure having embedded identifiers specifying resources located on the network, and

wherein the at least one reference is an embedded identifier specifying a network resource of the second server.

6. The method of claim 1, further comprising:

returning a network resource to the client;

configuring the network resource so as to cause the client to contact the second server so that the second server can measure a second efficiency rating for communication with the client; and

retrieving the second efficiency rating.

7. The method of claim 1, wherein each of said servers store efficiency ratings on a commonly accessible storage device.

8. The method of claim 1, further comprising:

storing efficiency ratings for communication with the client on a local storage device; and

retrieving at least one of said stored efficiency ratings from said second server over a communication channel different from the network.

9. The method of claim 1, wherein said providing the efficiency rating comprises determining an end-user delay between the client requesting network resources from at least one of said servers, and the client's receiving said requested first network resource therefrom.

10. The method of claim 1, wherein the incoming connection from the client is generated by a browser, and wherein the efficiency rating measures efficiency of delivering web page resources to the client.

11. The method of claim 1, further comprising:

contacting a resolution service so as to determine the first server has a closest geographical proximity to the client;

contacting the first server in accordance with its being geographically closest to the client; and

contacting the second server in accordance with the second server having the higher efficiency rating notwithstanding the first server being geographically closest to the client.

12. An article, comprising a storage medium having instructions encoded thereon for execution by a processor, said instructions capable of directing the processor to perform:

receiving by a first server an incoming connection from a client in communication with said servers over a network;

providing a first efficiency rating for communication between the first server and the client, wherein said providing comprises a selected one of: measuring communication efficiency between the first server and the client, and looking-up a previously measured communication efficiency between the first server and the client;

determining a second efficiency rating for communication between the second server and the client; and

directing the client to subsequently communicate with the second server when the second efficiency rating is better than the first efficiency rating.

13. The apparatus of claim 12, wherein said instructions for directing the client to subsequently communicate with the second server comprise instructions to direct the processor to perform:

returning a network resource to the client containing at least one reference therein to the second server.

14. The apparatus of claim 13, wherein the at least one reference comprises a web page element linking to the second server such that activation thereof by the client causes the client to contact the second server.

15. The apparatus of claim 13,

wherein the network resource received from the first server comprises a tag based data structure comprising embedded identifiers specifying resources located on the network, and

wherein the at least one reference is an embedded identifier specifying a network resource of the second server.

16. The apparatus of claim 12, said instructions including further instructions for:

returning a network resource to the client;

configuring the network resource so as to cause the client to contact the second server so that the second server can measure a second efficiency rating for communication with the client; and

retrieving the second efficiency rating.

17. The apparatus of claim 12, wherein each of said servers stores measured communication efficiency ratings on a commonly accessible networked storage device.

18. The apparatus of claim 12, said instructions including further instructions for:

storing by the first server and the second server of efficiency ratings for communication with the client on a local storage device associated thereto;

wherein the first server retrieves stored efficiency ratings from said second over a communication channel different from the network.

19. The apparatus of claim 12, wherein said instructions for measuring efficiency ratings include further instructions for:

determining an end-user delay between requesting network resources from said servers, and the client's receiving said requested resources in response thereto.

20. The apparatus of claim 12, wherein the incoming connection from the client is generated by a browser, and wherein the efficiency rating measures efficiency of delivering web page resources to the client.

21. The apparatus of claim 12, said instructions including further instructions for:

providing a network site identifier to a resolution service for determining a geographically closest server of said servers mirroring the network site,

locating hosting server geographically closest to the client, wherein the first server is closest to the client;

contacting said fist one in accordance with its being geographically closest to the client; and

contacting the second server in accordance with the second server having the higher efficiency rating notwithstanding the first server being geographically closest to the client.

22. A method, comprising:

determining a first server being geographically closer to a client than a second server;

determining a first efficiency rating of communication between the client and the first server;

determining a second efficiency rating of communication between the client and the second server; and

evaluating whether the second efficiency rating exceeds the first efficiency rating, and if so, providing a web page of the first server which contains content linking to the second server.

23. The method of claim 22, further comprising:

determining said first efficiency rating based at least in part on first contacting, by the client, of the first server; and

determining said second efficiency rating based at least on part on second contacting, by the first server, of the second server.

24. The method of claim 23, further comprising:

maintaining by the second server of a rating table indexed according to client network addresses;

storing in said table an entry for each site hosting a copy of the web site, each entry indicating a measured communication efficiency between the client and each corresponding hosting site; and

sending to the first server said measured communication efficiency between the second server and the client.

25. The method of claim 24, wherein measuring communication efficiency between the client and the first and second servers comprises:

first requesting first network resources from the first server, and determining a first end-user delay for the client in receiving said first network resources; and

configuring said first network resources to include web page data to cause the client to perform a second requesting of second network resources from the second server; and

determining a second end-user delay for the client in receiving said second network resources.

26. The method of claim 22, further comprising:

if the second efficiency rating exceeds the first efficiency rating, then receiving a web page from the first server with all web links directed towards the second server; and

if the first efficiency rating exceeds the second efficiency rating, then receiving the web page from the first server with all web links directed towards the first server.

27. An article comprising a storage medium having instruction encoded thereon, said instructions, which when executed by a processor, are capable of directing the processor to:

determine a first server being geographically closer to a client than a second server;

determine a first efficiency rating of communication between the client and the first server;

determine a second efficiency rating of communication between the client and the second server; and

evaluate whether the second efficiency rating exceeds the first efficiency rating, and if so, provide a web page of the first server which contains content linking to the second server.

28. The article of claim 27, said instructions including further instructions to:

determine said first efficiency rating based at least in part on first contacting, by the client, of the first server; and

determine said second efficiency rating based at least on part on second contacting, by the first server, of the second server.

29. The article of claim 28 said instructions including further instructions to:

maintain by the second server of a rating table indexed according to client network addresses;

store in said table an entry for each site hosting a copy of the web site, each entry indicating a predicted communication efficiency between the client and each corresponding hosting site; and

send to the first server, responsive to said contacting by the first server, said predicted communication for the second server and the client.

30. The article of claim 29, wherein predicting communication efficiency between the client and the first and second servers comprises:

first request first network resources from the first server, and determine a first end-user delay for the client in receiving said first network resources;

configure said first network resources to include web page data to cause the client to perform a second request of second network resources from the second server; and

determine a second end-user delay for the client in receiving said second network resources.

31. The article of claim 27, said instructions including further instructions to:

determine if the second efficiency rating exceeds the first efficiency rating, and if so, then receive a web page from the first server with all web links directed towards the second server; and

determine if the first efficiency rating exceeds the second efficiency rating, and if so, then receive the web page from the first server with all web links directed towards the first server.

Apparatus and Method For Facilitating Access To Network Resources

ABSTRACT

For a client seeking network resources from a network site, such as a web page, audio, visual, or other data, where the network site's desired network resources are also provided by mirroring network hosts, measurements are made to determine a communication efficiency between the client and the network site and mirroring network hosts. The client is then directed to communicate with the network site or a mirroring network host according to which had the highest measured communication efficiency with the client. In such fashion, real time adjustments can be made so as to more optimally distribute client network resource requests across all available sources of the desired network resources, and provide for real time load balancing and fail over of disabled hosts.

FIG. 1

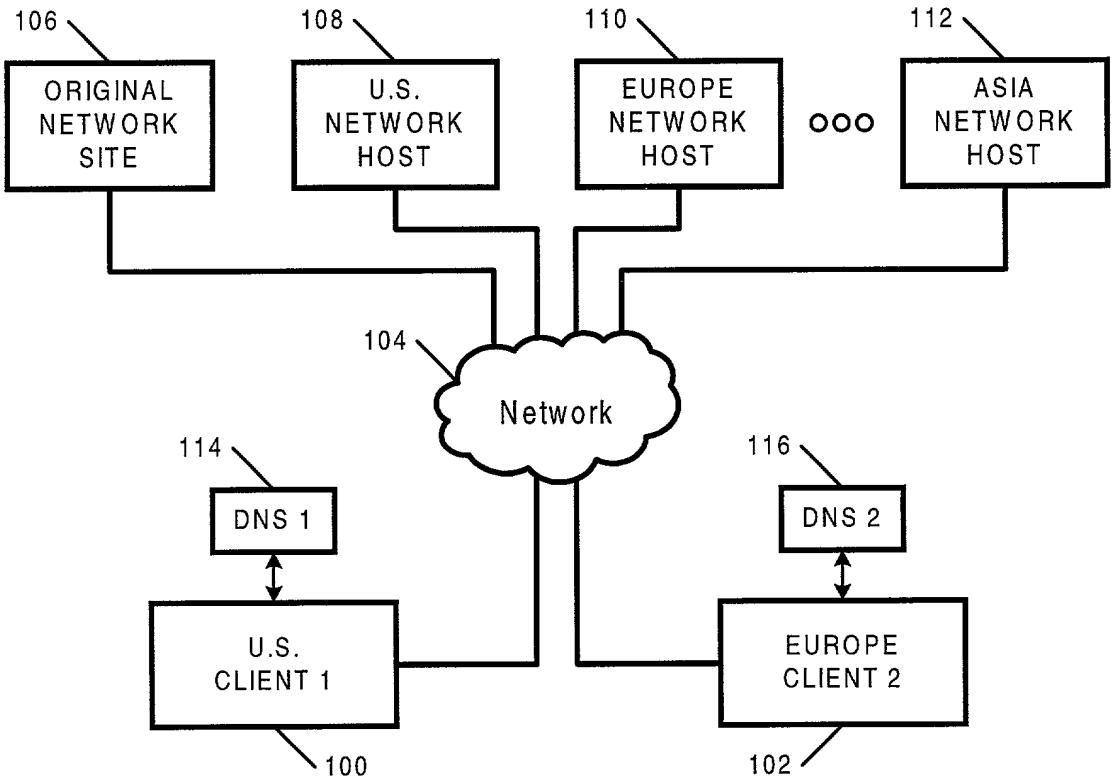

106
ORIGINAL NETWORK SITE
108
U.S. NETWORK HOST
110
EUROPE NETWORK HOST
ooo
112
ASIA NETWORK HOST
104
Network
114
DNS 1
116
DNS 2
U.S. CLIENT 1
EUROPE CLIENT 2
100
102

FIG. 2

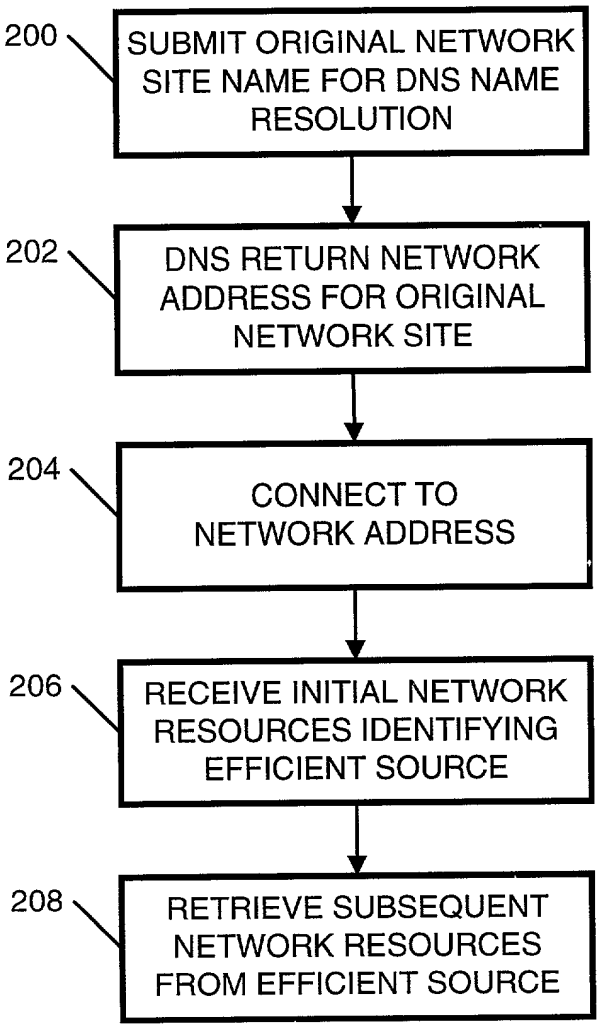

200
SUBMIT ORIGINAL NETWORK SITE NAME FOR DNS NAME RESOLUTION
202
DNS RETURN NETWORK ADDRESS FOR ORIGINAL NETWORK SITE
204
CONNECT TO NETWORK ADDRESS
206
RECEIVE INITIAL NETWORK RESOURCES IDENTIFYING EFFICIENT SOURCE
208
RETRIEVE SUBSEQUENT NETWORK RESOURCES FROM EFFICIENT SOURCE

FIG. 3

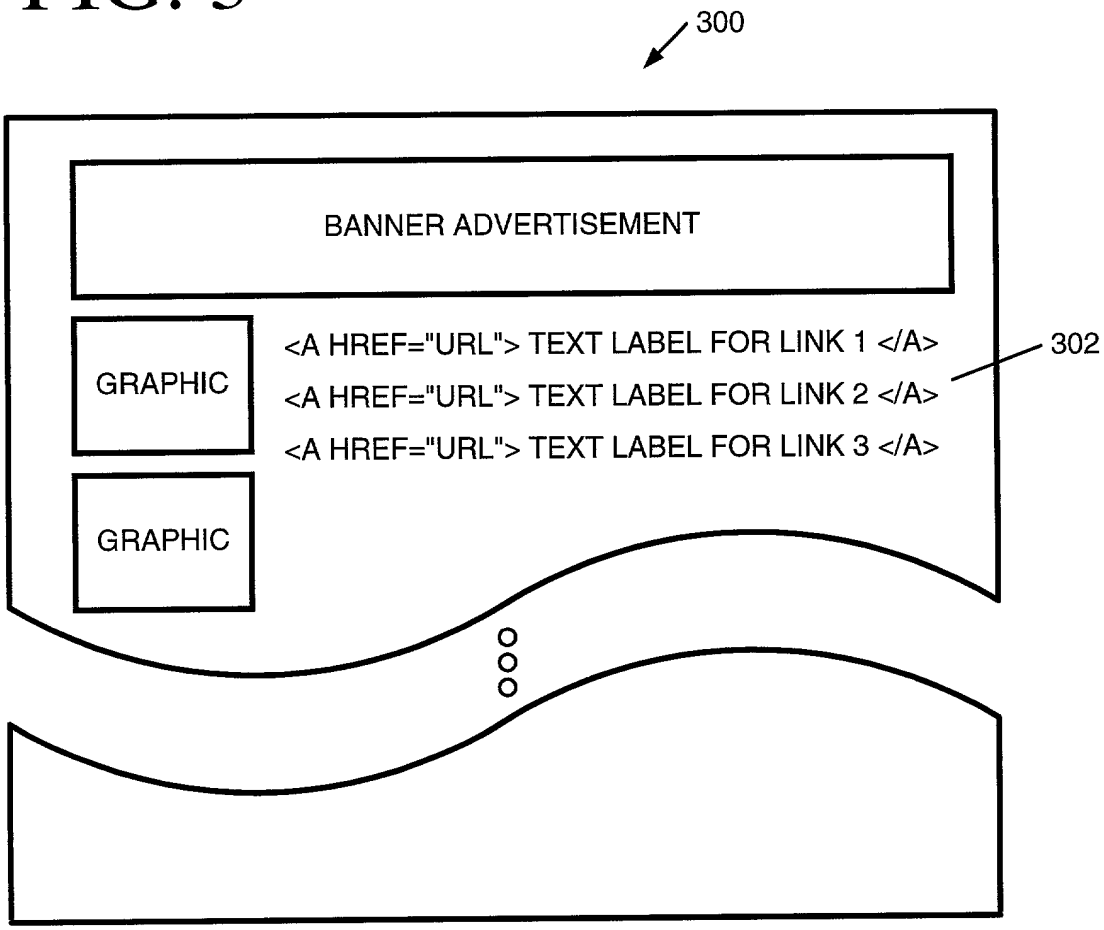

300
BANNER ADVERTISEMENT
GRAPHIC
GRAPHIC
<A HREF="URL"> TEXT LABEL FOR LINK 1 </A>
<A HREF="URL"> TEXT LABEL FOR LINK 2 </A>
<A HREF="URL"> TEXT LABEL FOR LINK 3 </A>
302

FIG. 4

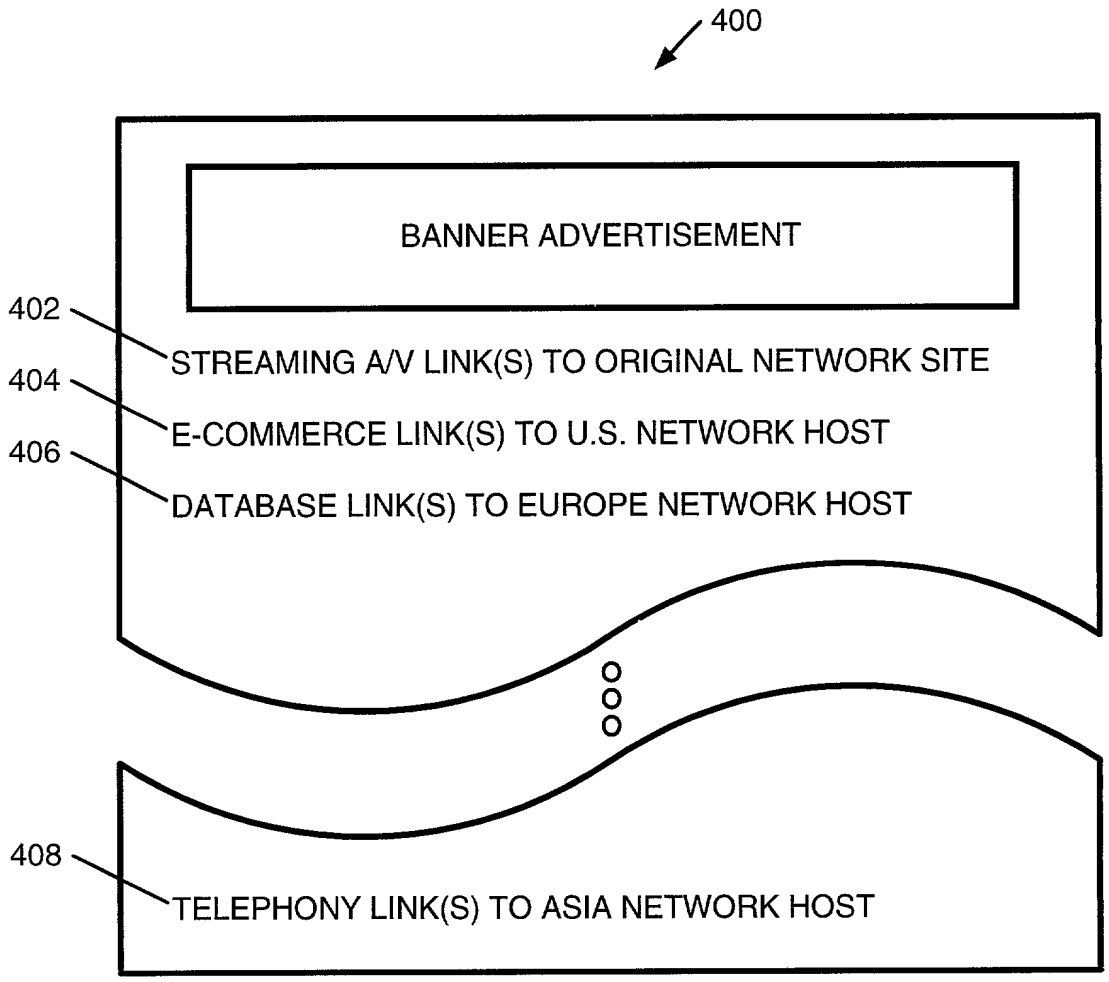

400
BANNER ADVERTISEMENT
402
STREAMING A/V LINK(S) TO ORIGINAL NETWORK SITE
404
E-COMMERCE LINK(S) TO U.S. NETWORK HOST
406
DATABASE LINK(S) TO EUROPE NETWORK HOST
408
TELEPHONY LINK(S) TO ASIA NETWORK HOST

FIG. 5

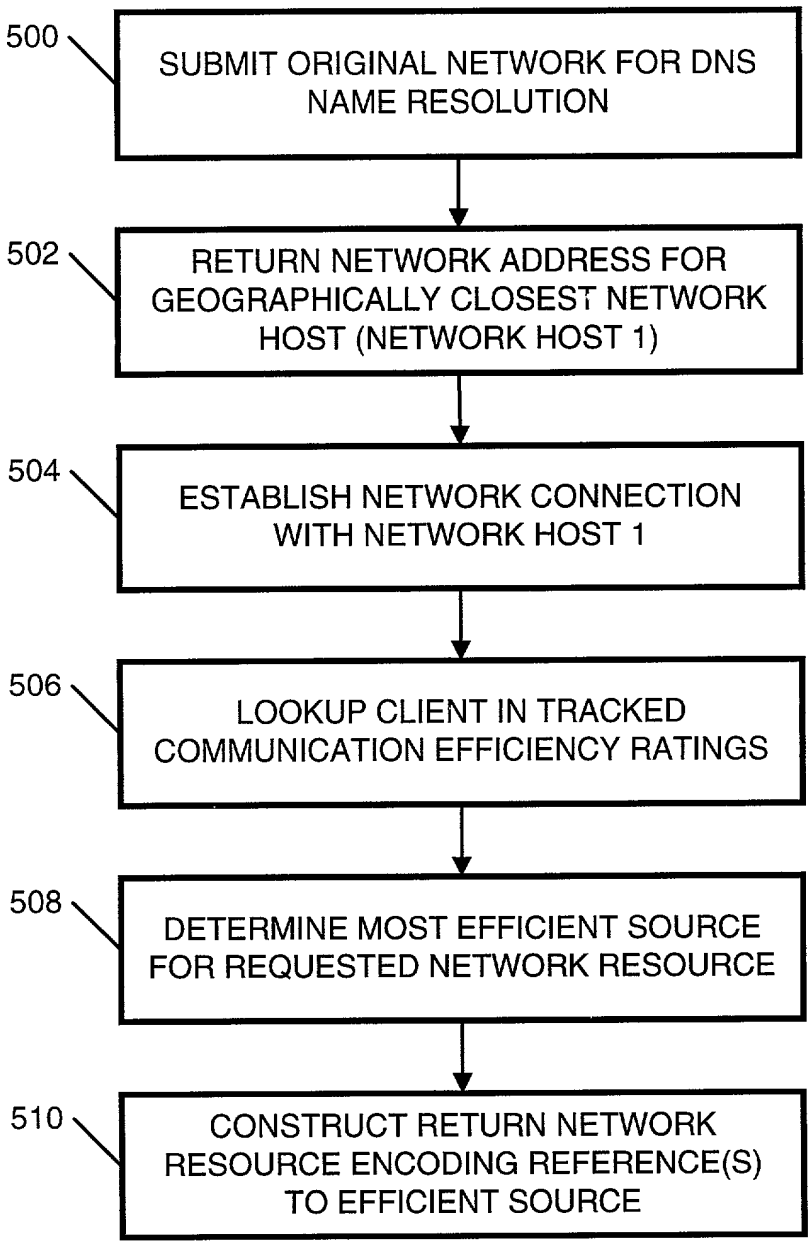

500
SUBMIT ORIGINAL NETWORK FOR DNS NAME RESOLUTION
502
RETURN NETWORK ADDRESS FOR GEOGRAPHICALLY CLOSEST NETWORK HOST (NETWORK HOST 1)
504
ESTABLISH NETWORK CONNECTION WITH NETWORK HOST 1
506
LOOKUP CLIENT IN TRACKED COMMUNICATION EFFICIENCY RATINGS
508
DETERMINE MOST EFFICIENT SOURCE FOR REQUESTED NETWORK RESOURCE
510
CONSTRUCT RETURN NETWORK RESOURCE ENCODING REFERENCE(S) TO EFFICIENT SOURCE

FIG. 6

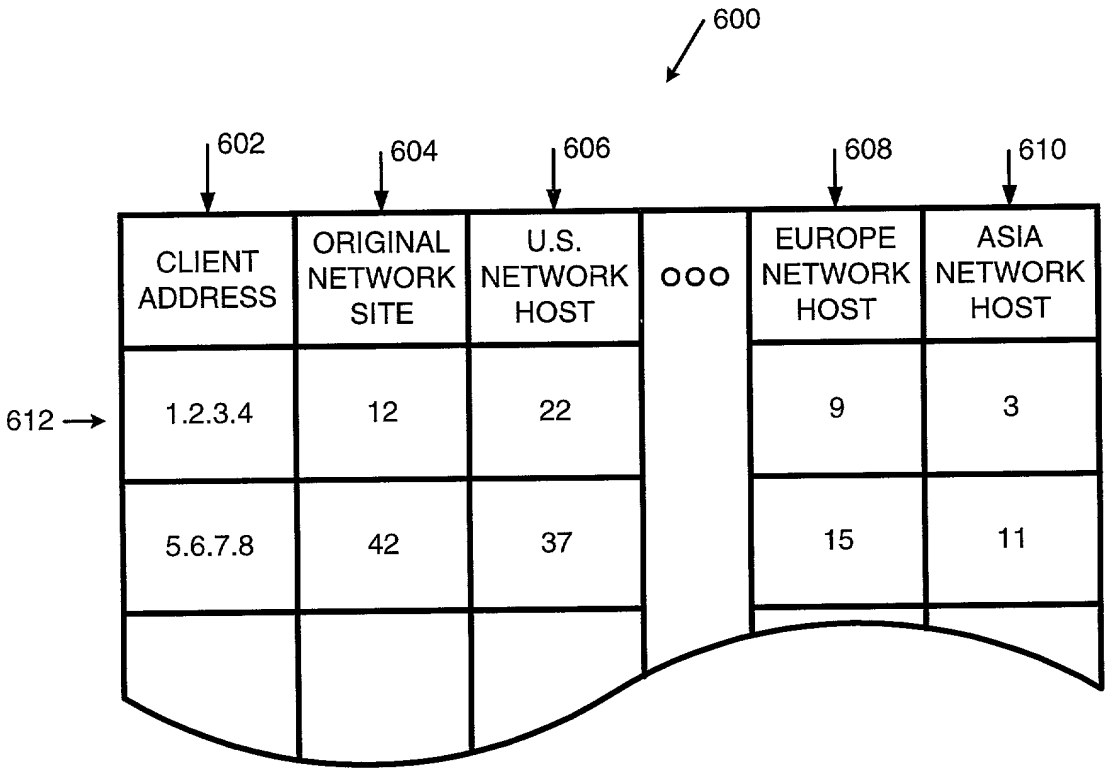

600
602
604
606
608
610
CLIENT ADDRESS
ORIGINAL NETWORK SITE
U.S. NETWORK HOST
ooo
EUROPE NETWORK HOST
ASIA NETWORK HOST
612
1.2.3.4
12
22
9
3
5.6.7.8
42
37
15
11

FIG. 7

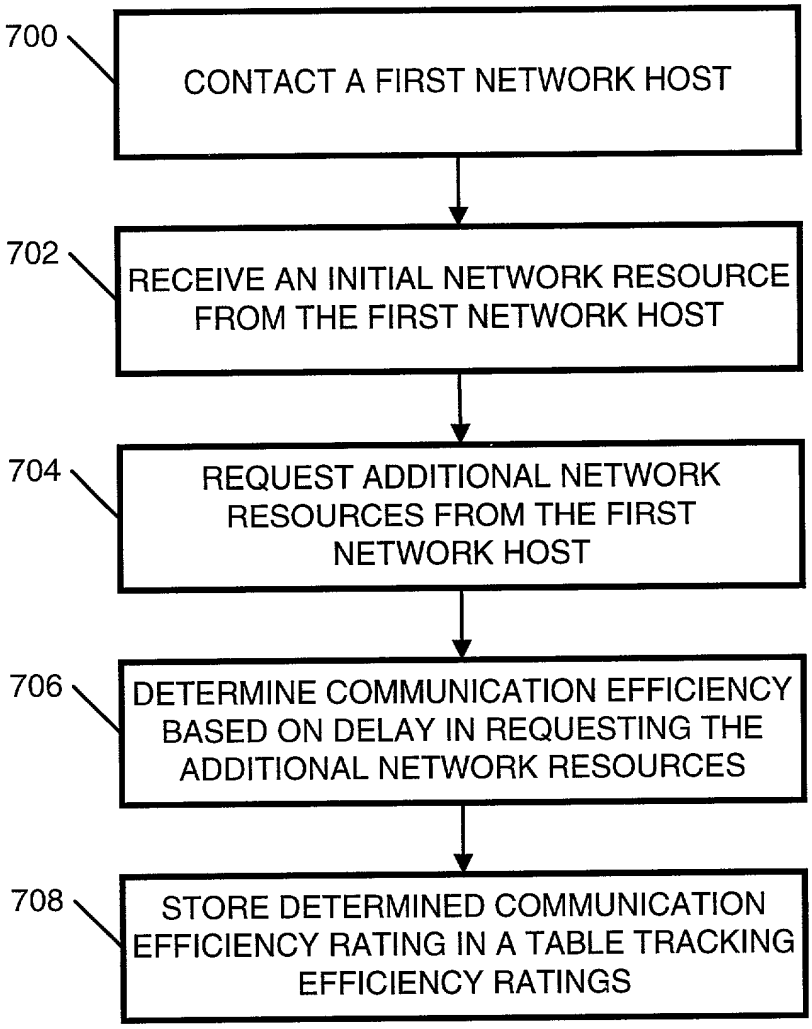
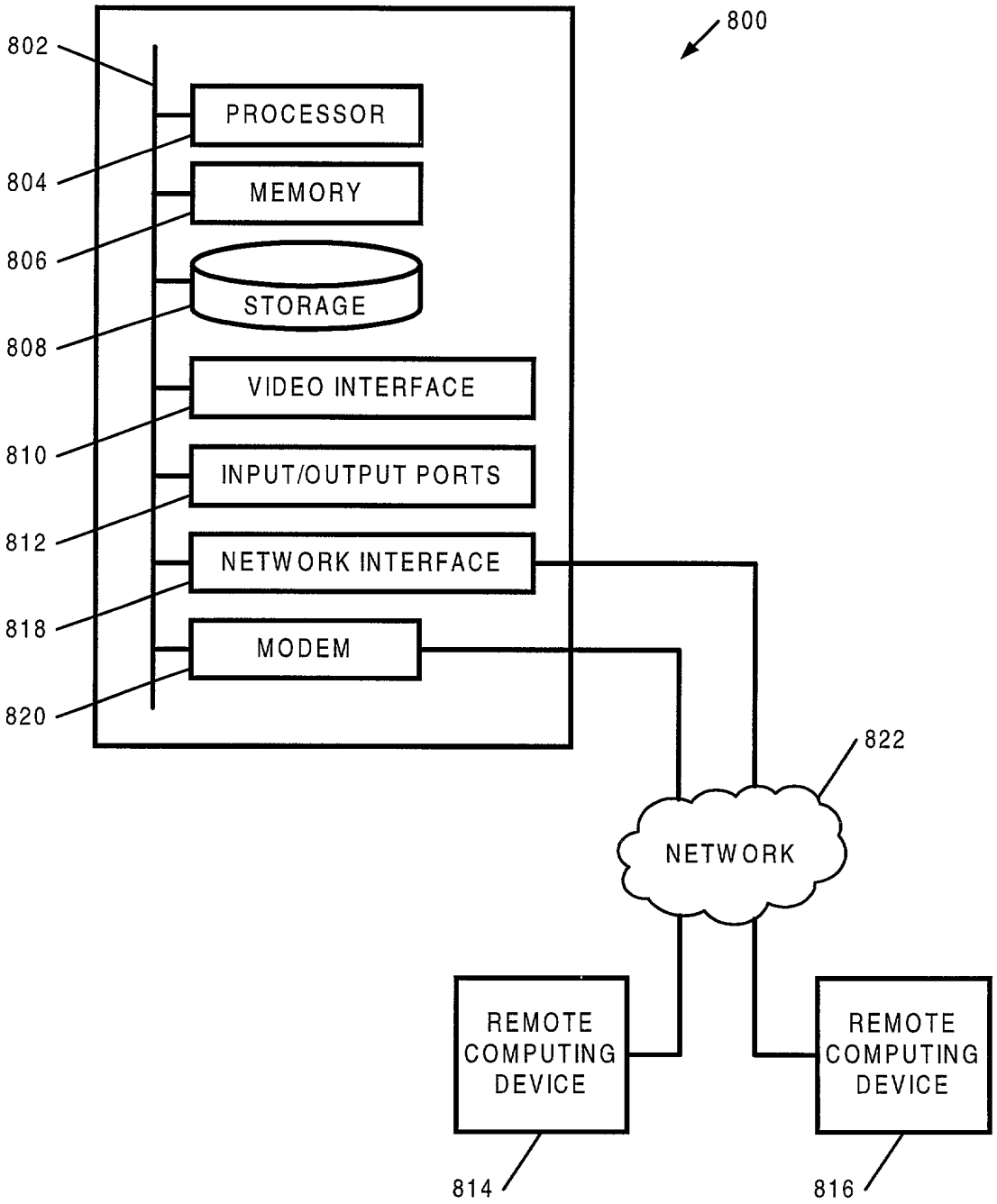

700
CONTACT A FIRST NETWORK HOST
702
RECEIVE AN INITIAL NETWORK RESOURCE FROM THE FIRST NETWORK HOST
704
REQUEST ADDITIONAL NETWORK RESOURCES FROM THE FIRST NETWORK HOST
706
DETERMINE COMMUNICATION EFFICIENCY BASED ON DELAY IN REQUESTING THE ADDITIONAL NETWORK RESOURCES
708
STORE DETERMINED COMMUNICATION EFFICIENCY RATING IN A TABLE TRACKING EFFICIENCY RATINGS

FIG. 8


800
802
PROCESSOR
804
MEMORY
806
STORAGE
808
VIDEO INTERFACE
810
INPUT/OUTPUT PORTS
812
NETWORK INTERFACE
818
MODEM
820
822
NETWORK
REMOTE COMPUTING DEVICE
814
REMOTE COMPUTING DEVICE
816

DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION
(FOR INTEL CORPORATION PATENT APPLICATIONS)

As a below named inventor, I hereby declare that:

My residence, mailing address and citizenship are as stated below, next to my name.

I believe I am the original, first, and sole inventor (if only one name is listed below) or an original, first, and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

APPARATUS AND METHOD FOR FACILITATING ACCESS TO NETWORK RESOURCES

the specification of which

☒ is attached hereto.

☐ was filed on _____ as
United States Application Number _____
or PCT International Application Number _____
and was amended on _____.
(if applicable)

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claim(s), as amended by any amendment referred to above. I do not know and do not believe that the claimed invention was ever known or used in the United States of America before my invention thereof, or patented or described in any printed publication in any country before my invention thereof or more than one year prior to this application, that the same was not in public use or on sale in the United States of America more than one year prior to this application, and that the invention has not been patented or made the subject of an inventor's certificate issued before the date of this application in any country foreign to the United States of America on an application filed by me or my legal representatives or assigns more than twelve months (for a utility patent application) or six months (for a design patent application) prior to this application.

I acknowledge the duty to disclose all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, Section 119(a)-(d), of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s):

APPLICATION NUMBER	COUNTRY (OR INDICATE IF PCT)	DATE OF FILING (day, **month**, year)	PRIORITY CLAIMED UNDER 37 USC 119
			☐ No ☐ Yes
			☐ No ☐ Yes
			☐ No ☐ Yes

I hereby claim the benefit under Title 35, United States Code, Section 119(e) of any United States provisional application(s) listed below:

APPLICATION NUMBER	FILING DATE

I hereby claim the benefit under Title 35, United States Code, Section 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, Section 112, I acknowledge the duty to disclose all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

APPLICATION NUMBER	FILING DATE	STATUS (ISSUED, PENDING, ABANDONED)

I hereby appoint the persons listed on Appendix A hereto (which is incorporated by reference and a part of this document) as my respective patent attorneys and patent agents, with full power of substitution and revocation, to prosecute this application and to transact all business in the Patent and Trademark Office connected herewith.

Send correspondence to:
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(Name of Attorney or Agent)
12400 Wilshire Boulevard, 7th Floor, Los Angeles, California 90025 and direct telephone calls to:
Steven D. Yates, (503) 684-6200.
(Name of Attorney or Agent)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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Inventor's Signature _____ Date _____

Residence _____ Citizenship _____
(City, State) *(Country)*

P. O. Address _____

_____

Full Name of Fifth/Joint Inventor (given name, family name)

Inventor's Signature _____ Date _____

Residence _____ Citizenship _____
(City, State) *(Country)*

P. O. Address _____

_____

Full Name of Sixth/Joint Inventor (given name, family name) _____

Inventor's Signature _____ Date _____

Residence _____ Citizenship _____
(City , State) *(Country)*

P. O. Address _____

_____

Full Name of Seventh/Joint Inventor (given name, family name) _____

Inventor's Signature _____ Date _____

Residence _____ Citizenship _____
(City , State) *(Country)*

P. O. Address _____

_____

Full Name of Eighth/Joint Inventor (given name, family name) _____

Inventor's Signature _____ Date _____

Residence _____ Citizenship _____
(City , State) *(Country)*

P. O. Address _____

_____

Full Name of Ninth/Joint Inventor (given name, family name) _____

Inventor's Signature _____ Date _____

Residence _____ Citizenship _____
(City , State) *(Country)*

P. O. Address _____

_____

Full Name of Tenth/Joint Inventor (given name, family name) _____

Inventor's Signature _____ Date _____

Residence _____ Citizenship _____
(City , State) *(Country)*

P. O. Address _____

_____

Full Name of Eleventh/Joint Inventor (given name, family name) _____

Inventor's Signature _____ Date _____

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P. O. Address _____

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